sure which corresponds to the rate of flow in tapped trees. By employing self-recording gages and thermometers complete seasonal records have been obtained which reveal a striking parallelism in the fluctuations of pressure and of temperature. This has led some to explain the phenomenon of sap pressure and flow as due simply to the expansion with rise of temperature of the gas imprisoned within the woody tissues; but the fluctuations observed in pressure and suction are far greater and more sudden than this physical explanation can account for. Thus variations are frequent in these gage records of ten or fifteen pounds pressure with a change of but a few degrees in temperature. Extreme fluctuations are recorded of nearly thirty pounds to the square inch, within twenty-four hours, viz., from 5 pounds suction to 22 pounds pressure. A rise of over twenty pounds in pressure was observed with a rise in air temperature of only two degrees, which would mean even less increase in tree temperature. The conclusion is that sap-flow in the sugar maple is a true bleeding phenomenon, attributable to the vital activities of living cells. The pressure shown by the gage is simply a partial expression of the energy of the countless living, working protoplasts of the maple stem.

There is little evidence of "root-pressure"; in fact on good "sap days" the flow into the tap hole comes chiefly from above downwards. We must regard the stem tissues as chiefly active, the cells in the vicinity of the tap hole operating alternately as suction and force pumps, so to speak, sucking the sap from root and remoter stem tissues and forcing it out through the tap hole.

It is not difficult to conceive how a rise of temperature past a critical point for their vital activities should arouse or stimulate the bleeding activities of the cells and how a fall below this point should check them. The suction thereupon developed would seem to be due to osmotic reabsorption of the exuded sap by the same cells. L. R. Jones.

PROCEEDINGS OF THE CLUB

Wednesday, February 24, 1904

This meeting was held at the New York Botanical Garden; Professor Underwood in the chair; sixteen persons present.

The minutes of the previous meeting were read and approved.

Dr. Britton referred to the opportunity of members to become applicants for a grant of fifty dollars from the John Strong Newberry Fund, which this year is available for botanical or zoological research.

The announced paper of the scientific progam was by Mr. Percy Wilson under the title of "Remarks on some Economic Plants of the East Indies."

In the spring of 1901, Mr. Wilson was commissioned by the New York Botanical Garden to accompany the Solar Eclipse Expedition to the East Indies, organized by Professor Todd of Amherst College, the chief purpose of Mr. Wilson's visit being to obtain collections of native plants and plant-products for exhibition in the museum of the Garden. Most of his collections were made on the island of Singkep, which is a two days voyage southward from Singapore. This island is about 25 miles in length and 16 in greatest width. Two-thirds of it is covered with a dense tropical jungle, the remainder having small scattered native villages. Various fiber-products, starches and sugars, manufactured and used by the inhabitants of these villages, were shown. In discussing fiber-products, examples were first exhibited in which a whole leaf or a considerable part of it is made use of. Of these leaf-fibers, one of the most extensively utilized is from the leaves of the screw-pines, whose generic name, *Pandanus*, is a Latinized form of the Malay word "pandan," a named applied to many species of the genus. In many of the East Indian islands, large tracts are covered by these *Pandanus* trees or shrubs, growing in such profusion as to form impenetrable masses of vegetation; while species growing singly or a few together abound principally in the vicinity of the sea. The latter bear many thick aerial roots, which at a distance have the appearance of supporting the plant in the air. The leaves and roots are the parts of the chief economic importance. The leaves are gathered in large numbers, tied into bundles, are carried by the men to the villages, where the women remove with a large knife all spines from the margins of the leaf and the under surface of the midrib. Each leaf is then exposed to fire, after which it is cut with a sharp four-bladed knife into strips

of uniform width. After several days of soaking in water and bleaching in the sun, each strip is separately drawn between the thumb and a thin bamboo stick. By this treatment they become flexible and can be wrought into any desirable shape without injury to the fiber. Two plants in particular, "pandan tikar" (*Pandanus Samak*) the mat screw-pine and "pandan laut" (*Pandanus fascicularis*), the sea-shore screw-pine are considered as yielding the best grade of leaves for mat- and basket-weaving. Other species bearing larger and coarser leaves are regarded as inferior. Of these, the "mengkuang" (*P. atrocarpus*), an arboreal form, is commonly found in swampy places. The leaves of this are made into hats, and into large mats which often serve for the entire sides of houses or for the covering of carts. Styles and designs in weaving differ in the different islands. In some places highly colored mats with red, green, brown, and purple strips interwoven are to be found. The dyes used are said to be chiefly of vegetable origin. A red dye is extracted from the leaves of the teak, a green from the shoots of the banana, while brown or chocolate color is obtained by burying the strips in mud and water for several weeks. In some regions where species of *Pandanus* abound these thick aerial roots are used for corks; sections of these roots several inches in length are beaten out at one end and thus made to serve as brushes. Leaf-fibers from the leaflets of the "nipah" (*Nipa fruticans*), a low stemless palm, are woven into large shingles known as "attaps."

Fibers derived from the vascular bundles alone are obtained from the leaf-stalks of a common fern, *Dicranopteris linearis*. After the long bundles are split out from the stalks, they are drawn separately through a series of holes of gradually diminishing sizes punctured in a piece of tin. With the strong fiber thus obtained fine hats are made which are worn by the Malay men at their various festivals. The stems of the bamboo, or strips and fibers obtained from them, are put to a great variety of uses by the natives.

Various food-products of vegetable origin were then discussed. An important starch is sago, under which name are understood starches derived from several kinds of palms and cycads. Most

of it, probably, comes from the trunk of *Metroxylon Sagu*, the true sago palm, which inhabits many of the islands of the Malay Archipelago. This palm grows to a height of forty feet or more and has a large comparatively smooth trunk, from the interior of which the starch is derived. In the preparation of the sago a full-grown tree is selected just before the expansion of the inflorescence, the trunk is felled and cut into sections three or four feet in length, which are thrown into water and soaked for several days. Afterward, the outer fibrous portion is removed and the interior is reduced to a coarse sawdust by means of a crude grating apparatus. This sawdust-like powder is then put into a large vessel where the starch is crushed out with the aid of water and the feet of a native. It is then drawn off suspended in the water and is finally dried and shipped away for refinement.

Palm sugar is derived chiefly from the sugar palm (*Arenga saccharifera*) and the cocoanut palm (*Cocos nucifera*). The sugar is obtained from the *Arenga* by binding the numerous branches of the pendulous inflorescence into a compact cylinder, without removing them from the tree, and then chopping off the ends and making several incisions along the sides of the branches. The sweet sap is caught in a vessel made from a bamboo-stem ; it continues to flow for several days, is collected every twenty-four hours, and is boiled down over a crude oven.

The paper was brought to a close with remarks on masticatories such as the betel-nut — the fruit of the Areca palm (*Areca Catechu*) — and on some of the edible fruits, such as the durian and mangosteen.

Mr. G. V. Nash showed flowering species of Melastomaceae from the conservatories of the New York Botanical Garden, including one of *Heterocentron elegans* from Mexico and one of *Medinilla magnifica* from the Philippines.

Dr. N. L. Britton exhibited specimens of two apparently undescribed species of poplar from Wyoming, one allied to *Populus tremuloides* the other to *P. angustifolia*.

MARSHALL A. HOWE,
Secretary pro tem.